Information management: an integrative approach

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INTRODUCTION

The concept of information management was widely discussed in the 1970s given impetus by such factors as:

- Decision-makers paying attention to the sages of the post-industrial economy and articulating information as a fourth resource of enterprises (along with people, property and capital)
- Legislative influences such as the U.S paperwork Reduction act, as well legislation dealing with matters such as freedom of information, intellectual property, and privacy which forced greater attention on the handling of information
- The quality movement which emphasized the role of records and documents in providing support for quality systems
- Technological conversion which blurred the distinction between niches carved by information professionals such as data administrators, records managers, business analysts, librarians and editors

More recently we have seen the profile of information management diminished in favour of knowledge management, as business and government has focused on making better use of the intellectual capital that may embodied in people and processes as well as recorded in documents.

There has been much written about the distinction between information and knowledge. Indeed one of the principles that is often espoused for successful knowledge management is that there should be a shared corporate definition of knowledge and its relationship to information, so that managers have a shared conceptualisation of what it is that is being managed. My own view is that rather than knowledge being managed, it is information and people - people who provide the tangible manifestation of the knowledge.

Therefore it is information management and human resource management that together achieve the effective utilisation of knowledge.

I would like to concentrate on information management anew and by articulating how it can be employed in different domains, try to improve the approach to dealing with that part of an organization's intellectual capital that is documented or recorded – what many have termed the corporate memory.

LEVELS OF INFORMATION MANAGEMENT

Management of business processes is often described as being at operational, tactical and strategic levels. Diener (1992), while not exactly following this characterisation, delineated technical, analytical and strategic domains of information management. These may alternatively be described as the procedural, assessment, and administrative aspects.

In the ***Technical*** or narrow operational sense, the following descriptions may be used:

- The organization of personal or corporate records
- Procedures such as indexing, classification, filing and cataloguing, that are used to provide access to collections of documents, or to other recorded forms of information ranging from historical archives to digital imagery
- Control of the description of an organization's data through use of a data dictionary
- Use of techniques such as collocation and abstracting, and of tools such as software packages for storage and retrieval of collected information
- Definition and maintenance of databases that support business analysis
- Selection, organization, control, analysis and dissemination of information by an intermediary for an end-user
- Analysis and reduction of information into surrogate form, and organization and presentation of this form for re-interpretation
- Structuring and indexing a file of lessons-learned to support knowledge transfer
- Design and maintenance of an enterprise information portal on an intranet

In each of the preceding definitions, the emphasis is on technique, methodology and procedure. They have in common a requirement for metainformation - the *information about information* that helps to organise the information that is of concern to the person who will ultimately use it. For example, in a database dealing with description of property for a geographical information system, the information of concern to the ultimate or end user is the description of the size of a property, its value and so on. The metainformation is the names and definition of the data elements that contain the property information, and the search protocols necessary for retrieval of that information.

In the ***Analytical*** sense, the emphasis is on assessment and evaluation, for example:

- Studies of information needs and use by particular groups

- Production of information resource inventories
- Determining the requirements of information services and systems
- Conducting a knowledge audit to determine the where knowledge resides in an enterprise, and how it may be transferred

These processes have in common the fact that they are not carrying out operational information management, but are identifying what needs to be carried out, how and why it should be carried out, and to what end - with particular reference to those who are going to use it.

If we approach the concept from a wider business-oriented framework, we find that the operational and analytic approaches are addressed, but that emphasis is more on planning, management and administration. To take a ***Strategic*** approach:

- The administration of all manual and automated data, and of all methods used for the communication, manipulation and presentation of information used in the course of doing business
- Establishing a learning culture based upon effective recording and communication of knowledge assets, and associating these with external information sources
- A fundamental managerial discipline founded on the conviction that both public and private sector organizations must treat information as a resource, in a manner similar to financial, physical, human and natural resources
- Development of strategy and policy for information handling
- A means of promoting organisational effectiveness by enhancing the capabilities of the organization to cope with the demands of its internal and external environments in dynamic, as well as stable conditions; this includes two dimensions:

    - Managing the information process so that the knowledge resources of the organization, are utilised effectively for organisational decision making
    - Ensuring that the various types of data an organization uses, and the various ways that data are handled and processed can support the needs and demands of the information process

The British Government's Central Computer and Telecommunications Agency provides an example that takes into account this delineation by levels. In addressing the role of information management in government departments, it characterised the underlying questions to be addressed by the tasks of information management (CCTA, 1990).

I have taken some of the examples that they give and incorporated them within a table to show how different aspects of business processes may be identified with the respective levels.

Task	Level
Determining a department's business aims and objectives	Strategic
Determining information needed to support those aims	Analytic
Identifying information available in a department	Analytic
Establishing differences between needs and provision	Analytic
Ensuring processes that match needs with provision	Technical
Identifying best means of provision	Analytic, Technical
Considering means of further exploitation of information	Strategic

Table 1: Tasks in information management domains

FROM STRATEGIC TO OPERATIONAL

I would like then to explore how we might work within a framework of information management beginning from the premise of treating information as a resource then considering how it may be operationalized. To begin with we should consider some of the trends that contribute to this way of thinking.

Accountants, as we would expect, have investigated developments that influence how we recognise the economics of intangible value. Many of these trends have relevance to dealing with information as a resource, for example:

- Qualitative non-financial concerns have assumed an increasing profile relative to financial concerns, but audits of non-financial domains are yet to be institutionalised
- New ways of working such as telework, have significant implications for tangible resources such as office buildings, repositories and transportation systems
- Fundamental discontinuous change (transformation), is a factor (of which intangible value is representative) in the future of economies
- Transaction costs from trading and services are falling because of network technology
- Innovation is replacing optimisation as the future seems more uncertain
- Human capital is placed more at the heart of an institution's value, and technology is seen to be for enhancement rather than replacement of this value
- Knowledge is more easily disseminated and is filtered increasingly through interested parties rather than professions
- The concept of 'more' as an economic measurement is under threat (Society of Management Accountants of Canada, 1998), except by the illusory mechanism of doing things faster; valuing irreproducible time and infinitely reproducible information are becoming stronger imperatives than money and goods

Management typically views enterprises as operating within strategic (formulating the objectives of an enterprise), tactical (making strategic objectives operational, and undertaking effective and efficient distribution of resources to accomplish those objectives) and operational (maintaining procedures for carrying out specific tasks efficiently and effectively). With respect to IM, we can equate the strategic and operational levels management at least, with the levels that we identified earlier for IM.

Therefore at a strategic level, we should consider those policy components of an enterprise that pertain to IM, and how they may be expressed as objectives. This has been done at length by writers such as Orna (1999) who has documented case studies of information policy development. Elsewhere (Middleton, 2002), I have given examples of some of these components. Some of these are shown in the Table 2 below.

I would like to take 3 examples from this table and illustrate how we can apply analytical and operational domains of information management within such a strategic framework. The three that I will consider are:

- Utilisation
- Authority
- Acquisition

Policy component: utilisation

A mantra in IM has been to get appropriate information to people when they need it in the form that they need it: "right information to the right people at the right time". The table below gives examples of policy objectives that can set the agenda before this, but in information management terms they must be implemented through the analytical and operational levels.

The analytical level in this case involves determination of information user needs. What is an information need? It seems that before we decide to do something (or not to do anything); we take in information to assist us with our decision. We are trying to reduce the uncertainty with which we make our decision. Therefore we could spend all our time taking in information in the expectation that something significant may come along to influence a decision ...., and never get around to the decision. (Sometimes that is used as a good principle of public service!). Decision-making is not necessarily our immediate objective. In a more wide-ranging sense, we could say that we seek information in order to advance the state of our knowledge, to fuel our learning, and to prepare us for problem solving.

Establishing what is needed presents challenges, because if asked, users may not be able to articulate their needs, or instead they itemise their wants – what they would like to have – which may be a different thing altogether. And what is a user? Sometimes a user may be a customer, paying for an information service. In many cases the user will be a

staff member of an enterprise, entitled to the information services available within the organization. Then again, they may be an 'end user'. If so, they are likely to be a user of a system or facility that has been made available to them to work with as they see fit, and they are making use of it for their own purposes, rather than passing on results to others.

Policy Component	Example
Definition	• Define the enterprise mission and objectives, and the requirements for managing documents within the organization to promote knowledge and information sharing
Acquisition	• Ensure that documentation acquired from external sources or generated from within the enterprise is fit for purpose and managed.
Utilisation	• Exploit information fully, to meet all current needs, and to help meet changes in goals and in the operational environment
	• Use knowledge and information ethically in all internal and external dealings
	• Provide appropriate human and financial resources for managing and developing the use of information and knowledge
	• Ensure that it reaches, on time, and in the right format, all the people who need to use it
Evaluation	• Audit the use of information and knowledge regularly to ensure that what is needed is available and that it is used appropriately and to good effect
	• Provide for a coordinated overview of total resources of knowledge and information
	• Develop and apply reliable means of assessing the costs and value of information, and the contribution it makes to achieving objectives
Disposal	• Identify conditions under which information media may be eliminated
Authority	• Identify the people responsible for managing specific resources of information, and those who are 'stakeholders' in them, and ensure that the authority of the mangers of information resources matches the responsibility they carry
Communication	• Promote information interchange between managers of information resources, and between them and stakeholders
Infrastructure	• Develop and maintain an infrastructure of systems and ICT to support the management of information resources and information interactions within the organization and externally
Access	• Pursue maximum openness of access to information inside the organization and externally
	• Safeguard current and historical information resources so that they remain accessible for use at all times

Table 2: Extract from table of information policy components (Middleton, 2002)

Information management tackles the process of understanding information requirements of users in two ways. These are information need, which concentrates upon the user, and information use, which concentrates upon the product or system that services their needs (Hewins, 1990).

The former identifies a requirement that can be addressed by nomination of particular information *sources*, and endeavouring to fulfil the need from those sources, either by providing an answer directly or by showing users how to find it themselves. This is the service-oriented approach that is provided for example by libraries, information centres and call centres. On the other hand, information use identifies the *processes* that are necessary to fulfil the information requirement on an ongoing basis. So, by means of requirements analysis, identification of information tasks, system analysis and design for usability, the idea is to create an information system with which end users henceforth service their own information needs. This is the approach commonly used by information systems professionals through systems analysis and project management.

However, if you examine the many studies of information seeking behaviour, you will find that contrary to the distinction that we have made between need and use in the preceding paragraph, there are also many studies of use that focus upon the users' behaviour as they use a system (typically an information retrieval facility), rather than looking towards a system as an outcome. These studies are usually directed towards identifying ways to assist the user to learn, rather than building a system for ongoing information use.

It is important too, to make a distinction between individual use and group use of information. Many information seeking studies are carried out to model the behaviour of a group – hospital patients, consumers who use electronic media, undergraduate students, operators of an insurance claims system – that for the purpose of the exercise are regarded as homogeneous. This is done in order to construct a service or system that best suits a group's needs. At best the outcome may be flexible enough to allow individuals to adapt it for their own information use preferences. However there is an assumption of situational or organisational factors constraining the individual users in the group to operate in much the same way.

Whether the focus of our analysis has been on need or on use, the operation of the process that satisfies the user requirements must then be undertaken, so now we consider the operational level of information management.

There are many aspects of this but broadly they may be considered as the organization and retrieval of information. We do this in a variety of ways through indexes, classification schemes, repositories, finding aids and the retrieval systems that accompany them.

Much of this work involves assigning metainformation. The time spent doing cannot be underestimated, and for that reason a great deal of research has gone into the automatic production of metainformation, principally through what we call derived indexing

systems. Among the more obvious manifestations of this work are the results of search engine searches of automatically produced repositories derived from web spiders on the Internet, or full text retrieval from newspaper or legal databases.

Most of you will be familiar with the 'infoglut' that may arise from such searches – often because the retrieval system does not have a means of establishing the context in which the searcher approaches a query. This deluge may be filtered using techniques of refinement ranging from imposed classification schemes to retrieval features such as proximity searching, weighting and relevance feedback. However effective application of these will remain the province of professional intermediaries unless there is a concerted program to enable all desktop users to become more information literate. This means progressing them from an ability to find 'known items', to an ability to browse effectively in order to clarify, refine re-articulate and fulfil information needs.

Even so, I cannot see that we can get to stage of doing without professional intermediaries who provide the information organization to ease the path for others. A case in point that should be familiar to most of you is the organization of Internet and Intranet websites.

The elements of site organization owe a great deal to the principles developed for human-computer interaction. These may be summarised as shown in Table 3 following.

Information visualisation has been used as a term to express how we may better comprehend data by presenting it in graphical form. Another term that has gained increasing parlance, since the institution of the Web, is information architecture.

This is an attempt to express the notion with all human interfaces to information systems, but particularly as manifest at Websites, that usability is more than a matter of visualisation. It has been spoken of as an integrative approach that for a database integrates design of labels, messages, online support elements and printed support elements, with particular reference to the way that users carry out tasks (Henry, 1998). In Web terms, it is also about taking into account the way in which associations are created through links, and how a site is managed so that it evolves without need for significant reorganisation.

A person who is an information architect (Rosenfeld & Morville, 1998) is expected to:

- Clarify the mission and vision for a site, balancing the needs of its sponsoring organization and the needs of its audiences
- Determine the content and functionality of a site
- Specify how users will find information in the site by defining its organization, navigation, labelling and searching systems
- Map out how the site will accommodate change and growth over time

Any enterprise with an aspiration to carry out its information organization through an Intranet/Internet interface, will need to undertake content management utilising principles such as the above. Maintaining quality systems within such an approach will require

reference to information standards such as XML for markup of documents (Cover, 2002), AGLS for document description (National Archives of Australia, 2000) and *AGIFT* (National Archives of Australia, 1999) or subject thesauri for content description.

- *Clarity* :	the screen information should be well organised and easy to assimilate incorporating such points as an informative title, clear and logical separation of information areas, effective colour use and appropriate alignment
- *Consistency*:	the utilisation of constant sequences of instructions or actions or colour schemes for similar situations; information presentation from screen to screen should be consistent with respect to such matters as the cursor presenting in the same initial position, type faces being the same, option selection being uniform, and abbreviations, icons, acronyms, colour clues, and function keys being used in the same way throughout;
- *Explicitness*:	the way the system works and is organised, should be clear to the user community and metaphors used should correspond as much as is practicable with their understanding of operation;
- *Shortcuts*:	frequent users who become familiar with the sequence of an interaction, should be provided with ways of circumventing steps that may be necessary for a new user who is becoming familiar with software; users require economy of action to minimise time spent getting to desired information; looking for ways of reducing the sequence of keystrokes should be a priority;
- *Feedback*:	the user should be provided with indications that something has been undertaken as a result of their input – even if it is as simple as an indication the software is 'working on it';
- *Closure*:	sequences of actions should be organised in such a way that a completion point is obvious, for example with the fill-in of forms, or discrete parts of forms that different sections must complete;
- *Error handling*:	the system should be designed so that the user cannot move down an error pathway, but if they do, a comprehensible explanation should be provided, along with an escape mechanism, or mode of correction
- *Reversal*:	the 'undo' button or menu should be obvious and established so that a system may revert to its prior state, should the user be unhappy with input
- *Control*:	this is support for operations that reinforce users' perception that they are the locus of control for the software, rather than feeling exasperated by inexplicable responses, or tedious data entry requirements
- *Memory load*:	reduce short-term load to minimise what the user must recall from other screens, or earlier pages, and provide support such as pop-up explanations for steps, or abbreviations …
- *User assistance*:	online support should be up-to-date, corresponding with the present generation of screens, and be in context where possible.

Table 3: HCI principles

Policy component: Authority

Earlier, in Table 2 I gave an example of an objective relating to information policy as identifying the people responsible for managing specific resources of information, and those who are 'stakeholders' in them, and ensure that the authority of the mangers of information resources matches the responsibility they carry.

Responsibility for the 'ownership' of information is a major factor in maintaining quality information. At the analytical level of IM there are various mechanisms by which help to establish this responsibility. These generally go under a rubric such as communications audit or information resource identification (Buchanan & Gibb, 1998). For example, if we adopt the latter approach, in addition to identifying the creators and users of information in an enterprise, for particular information resources, we might create an inventory that includes:

- A summary of internal and external resources entities by category and type
- An indication of the extent to which they are being used
- Estimates of total cost of resource requirements
- A matrix of relationships between users and producers of the information resources
- An overview of the extent to which the enterprise's activities are supported by different information resources
- An indication of information resources that are themselves core activities of the enterprise, and pointers to how they might be used better strategically
- A database that permits ongoing review of information and knowledge resources
- Indicators of value placed upon resources

Communication audits, are likely to involve analysis of recorded information, and may extend information mapping approaches such as the resource identification just mentioned. However they are more likely to concentrate upon informal channels of communication (to whom are people talking, what are they talking about, when is information given most credence, who should they be talking to …).

In this respect information and communication audits are like knowledge audits where the knowledge assets may be regarded as a combination of knowledge recorded as information and tacit (in people's heads). Wiig (in Macintosh, 1998), talks in terms of three "pillars" for knowledge management: surveying and categorisation of knowledge; appraisal and evaluation of its value; and synthesis of knowledge-related activities.

The surveying and categorising requires identifying what is a knowledge asset; what it contains; what is its use, its form and its accessibility; along with what its authority is. This would be followed by specifying those actions that are necessary to achieve better utilisation, planning use of the knowledge asset, enacting, monitoring and reviewing the usage to see if it produces the desired added value, or creates new opportunities.

I won't pursue knowledge audits further here as other speakers will be focusing on knowledge.

When we look at the operation of such authority, there are various contexts in which it may happen. One is the scheduling of documents for disposal. If a retention schedule for records is maintained, then it should include indicators of the people and positions that must approve the destruction, reformatting or relocation of documents. This will enable routing to them at appropriate times for decision-making.

Following up our information architecture example from earlier, operationalization in this area requires the identification on specific pages of who has signed off on the content of the page, along with a mechanism of review for the page, so that the web manager ensures that there is periodical updating or removal.

Policy component: Acquisition

Our third example of a policy component, acquisition, is defined in terms of obtaining information from external resources.

Analysis of requirements in this area, is similar to that which is outlined under utilisation earlier. However, it is likely to go beyond identifying the needs of individuals to articulation of what an organization needs to know. The mechanism for doing this may be embodied within what is sometimes called environmental scanning or business intelligence. I see this happening in what I call a general environment and an operating environment.

The general environment is probably of more interest in the public sector and comprises:

- *Societal* information such as demographics relating to population movements, life expectancies, consumer activism, environmental awareness and leisure utilisation
- *Technological* information relating to new products, technology transfer from research to marketplace, automation applications and effects on productivity, research and development programs of government, universities and scientific organizations
- *Economic* information such income distribution and disposable incomes, employment levels, inflation, interest rates and other financial indicators.
- *Political* information relating to potential changes of government, and regulatory framework for such matters as trade, employment and financial services

The operating environment is more oriented towards competitor intelligence in the private sector as follows:

- *Production* such as anything to do with product range and evaluation, quality control, packaging, delivery, production capacity, and breakdown tolerance
- *Organization* such as ownership, control and management structure, extent of decentralisation, directors, links with other companies, facilities, financing, and asset return
- *Marketing* such as the extent of advertising budgets, the placement of product information for target markets, market share, pricing policies and discounts, service policies and performance, and customer distribution
- *Personnel* such as the range of human resources employed, their remuneration, the degree of movement in the workforce, the state of manager-labour relations, and the decision makers in organizations

Such areas still have relevance in government. In our context that would be particularly in relation to comparison with similar departments in other states or at federal level.

The operationalization of the environmental scanning process requires the identification of a unit such as a strategic planning unit with responsibility in the area, together with mechanisms such as push technology (what used to be called current awareness services) for scanning of information. This must be accompanied by formal procedures such as report writing that enable dissemination of the assimilated knowledge.

Acquisition of information is not confined to environmental scanning. Libraries have long had a role in selection of materials considered to be relevant to an organization and collection management concomitant with this. Their formal analytical procedures include conspectus development.

Level	Explanation
0	Out of scope
1	Introductory or basic material only (minimal collection)
1a	Minimal with uneven coverage
1b	Minimal with even coverage
2	Basic information supporting general enquiries
2a	Introductory
2b	Augmented
3	Supports general professional operational activity
3a	Introductory
3b	Augmented
4	Supports research activity
5	Comprehensive: significant works of knowledge, in all applicable languages

Table 4: Conspectus levels example

Conspectus may involve describing particular areas based upon broad classification areas from a scheme such as Dewey that represents the subject interest of the host organization. The description may be according to ratings such as those shown in the Table 4. For particular collecting areas, these may then lead to budgeting and commitment decisions that guide the operational process which is that of selection of materials.

Although such conspectus development remains useful, digital availability of information has re-oriented library emphasis from collections to access. There is now much greater concern for provision of documents (or the most appropriate information from them), through document delivery services.

There is also greater concern by libraries to manage the provision of interfaces to digital material. In this respect they have transformed the selection process to one of creating Website interfaces to specific subject areas. These portals may be publicly available generic ones, or specialised internal ones, that are associated with the environmental scanning concerns identified by the organization.

Therefore librarians too are concerned are concerned with the information architecture of the organization's information portal.

CONCLUSION

I have used three different examples of policy components to illustrate how the operational aspects of information management may be carried out, informed per medium of analytical processes that are undertaken guided by strategic policy objectives.

There are many other examples of carrying out information management operations that could be given. However these three serve to illustrate that information management is more likely to be implemented effectively, if three interrelated domains: the strategic, analytic and operational are identified, and are managed so that they function in a unified manner. A coherent strategic information management level, exemplified through information policy may then be used to shape the analysis of the information that an organization and its users require, and implement how best this information may be provided.

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